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A CASE OF BROWN-SÉQUARD'S PARALYSIS.

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PHYSICIAN TO ~~THE~~ SAN FRANCISCO POLYCLINIC.

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V. D., forty years old, an Italian, presented himself on March 11, 1892, stating that on October 6, 1891, in an encounter with a fellow-countryman, he was knocked down, and then, just as he was in the act of rising, was stabbed in the back. On again attempting to rise, he observed that the right leg was paralyzed. He now received a stab in the chest, and lost consciousness. Sixteen days after the injury he was removed to the French Hospital, and came under the care of Dr. Bazet, who states that at that time both wounds were closed, that the temperature was 102° , and continued so for eight or nine days after admission, and that the right leg was completely paralyzed. The patient further called attention to the insensibility of his left leg to heat and cold; he had noticed in the bath that, although he felt the contact of the water on the left leg, he could not recognize its temperature.

Condition, March 11, 1892. The patient is a powerful, well-nourished man. On his back, $1\frac{1}{2}$ cm. to the right of the eleventh and twelfth dorsal spines, there is a vertical scar $2\frac{1}{2}$ cm. long. There is another scar on the chest over the seventh rib, about 5 cm. to the right of the anterior median line.

Left Leg. The left leg shows no diminution of motor power. All movements are performed with normal force and precision. Tactile sensation is preserved;



very slight touches are perceived and accurately localized. When the skin of the leg is raised in a fold the act is recognized as such and correctly referred to its locality. There is, however, absolute analgesia over a great part

FIG. 1.

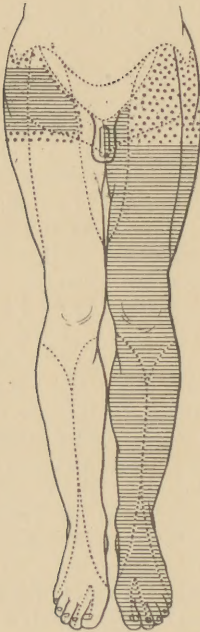
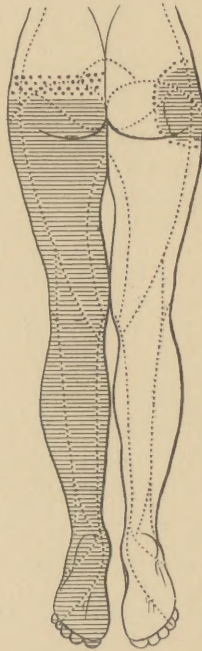


FIG. 2.



of the left lower limb. On the anterior surface, this area of complete analgesia extends from the toes to about the lower limit of the uppermost fourth of the thigh; thence upward the analgesia becomes less marked, the patient distinguishing between the head and the point of a pin,

without, however, experiencing a painful sensation when pricked. Sensation improves as we ascend, and is normal at Poupart's ligament. On the inner surface of the whole extremity the analgesia is complete up to the perineum, and on the posterior surface to the upper border of the buttocks; the latter limit is surmounted by an area of modified and gradually diminishing analgesia, like that on the anterior surface of the thigh.

What has been noted of the patient's insensibility to pain is equally true of his inability to distinguish between heat and cold. Wherever analgesia is complete the temperature-sense is likewise abolished, and where the former is incomplete the latter is more or less deficient.

There is no loss of muscular sensibility. The patient is under all circumstances aware of the posture of the limb, is able to recognize with his eyes closed passive changes in the position of its different segments, and to direct all movements with precision.

The patellar tendon-reaction is somewhat exaggerated. There is no ankle-clonus, but an active tendo-Achillis reflex. The plantar reflex is very faint; the cremasteric reflex is absent, and has not been elicited at any of the numerous investigations.

Right Leg. The right leg is almost totally paralyzed, its motility being limited to slight flexion at the hip-joint. The muscles are somewhat flabby and atrophied. The right thigh measures 46 cm. and 40.5 cm. at points corresponding with points at which the left measures 48 cm. and 43 cm. respectively. The greatest circumference of the right leg around the calf, however, is 35.9 cm. as against 35.1 cm. on the left. There being neither edema nor any other palpable cause for this difference, I am constrained to assume a congenital anomaly to explain this disproportion. The muscles contract upon stimulation with both currents, but a little less readily than those of the opposite limb.

There is no hyperesthesia. Sensation is normal from

the toes up to a line on the anterior surface corresponding with the level at which it has been noted that the analgesia and thermo-anesthesia begin to diminish on the opposite thigh. On the inner surface of the right thigh, in an area of the same extent as that in which the analgesia was observed to continue upward on the other limb, sensibility is preserved in all its forms. The anesthetic area extends up to Poupart's ligament, and also for some distance on to the posterior surface. In this district, tactile sensibility is much impaired, touches with a brush or the finger not being perceived at all, while the sharp prick of a pin is described as a gentle touch, except near the borders of the area, where the point and head of the pin are distinguished, but without painful sensation. This region is also insensible to heat and cold. The anesthesia does not terminate abruptly, in its whole intensity, but gradually diminishes in degree toward the parts in which sensation is normal.

The muscular sense is intact. Movements communicated to the leg or to the foot are recognized without the aid of vision, and are unerringly imitated with the left limb; for instance, alteration in the posture of the foot by faradization of the peroneal nerve.

The knee-jerk is very much exaggerated, far more so than that on the left side, and there is a slight patellar clonus. Ankle-clonus and the front-tap contraction of Gowers are easily elicited. The plantar reflex is very active, as is also the cremasteric reflex. The patient states that the left leg constantly feels warmer than the right.

On the right side of the *abdomen and back* there is a slight diminution of sensation as compared with the left side; to this the patient had himself called attention before examination. The obtuseness relates to all forms of sensation, and is more pronounced below, gradually diminishing upward, so that above the level of the um-

bilicus it is hardly perceptible. The abdominal skin-reflexes are absent on both sides.

The *left half of the penis and scrotum* is totally analgesic, and insensible to heat and cold.

The patient's virility is said to be much enfeebled, but not abolished. It is stated that during coition not only voluptuous sensation, but all sensation in the penis is absent. Erection and ejaculation are both less prompt than they had been before the injury. There is also vesical weakness, micturition being delayed, and the jet of urine less forcible than formerly. Of the rectal functions no complaint is made.

On June 22d great improvement in the motor power of the right leg was observed. Movements of flexion and extension at the hip and knee are executed with considerable strength, and the limb is now used in standing and walking, but the power of movement at the ankle and in the toes is still very deficient. The anesthesia and the condition of the reflexes are unchanged. On this occasion it was noted that perspiration was equal on both sides.

On October 22d (over one year after the injury) a further increase of motor power is evident. The patient walks without support of any kind, but there is some stiffness of the right lower extremity, and the gait is halting. The difference in sensation on the two sides of the trunk has disappeared. According to the patient's assertion, the uro genitary functions have improved. There is no other change in the man's condition, the anesthesia and the reflexes remaining otherwise as before.

Stab-wounds of the spinal cord have been but rarely observed at a level so low as in the case here reported. Bode¹ collated thirty-six cases, and found that in twenty the cervical, in twelve the upper half of the dorsal, and

¹ Berliner klin. Wochenschrift, 1891.

in only one (recorded by Viguès) the lumbar region of the cord was affected. In the instance related by Viguès¹ the weapon had penetrated between the ninth and tenth dorsal vertebræ, and thus probably injured the cord higher up than in the present case.

The foregoing symptoms are essentially those characteristic of a form of Brown-Séquard's paralysis, *i. e.*, hemi-paraplegia, with crossed anesthesia. The extent of the anesthesia, and especially the anesthetic patch on the right thigh, point chiefly to the second lumbar segment as the locality of the lesion, while the slight anesthesia on the abdominal wall shows that the next higher segment did not wholly escape injury.² This corresponds with the indication afforded by the situation of the scar on the back. Further, according to hitherto accepted teaching, it would be justifiable to assume that we have to deal with a lesion of the right half of the cord. Recently, however, doubt has been thrown on Brown-Séquard's interpretation of the complex of symptoms named after him. While Turner's³ experiments on monkeys confirm the theory that the sensory fibers (at least those of the lower extremities) soon decussate after their entrance into the spinal cord and pass up the opposite side, Mott⁴ insists on the absence of crossed anesthesia after hemisection of the dorsal cord in the monkey, and he is supported in his statement by C. D. Marshall, who experimented also on cats, and by Gotch and Horsley, who employed an electric method of examination. Gotch and Horsley,⁵ while conceding

¹ See Charcot: Œuvres complètes, t. i, p. 101.

² Starr: American Journ. of the Med. Sci., July, 1892, p. 32.

³ Brain, winter number, 1891.

⁴ Proceedings of the Royal Society, June 18, 1891; British Med. Journ., August 20, 1892. Proceedings of the Physiological Society, January, 1891 (abstract in Neurol. Centralblatt, 1892, No. 5).

⁵ Philos. Trans. of the Royal Soc. of London, vol. clxxxii B., 182, p. 477.

the existence of pathologic cases of motor paralysis on one side and anesthesia on the other, regard "the clinical experiences as either in no way indicative of the normal relations of the cord to the nerves, or as capable of explanation on the supposition that the lesion has affected at the same time the motor path (lateral column) on one side, and the principal afferent (posterior column) on the opposite side."

The merely clinical account of a case such as I have communicated contributes, of course, nothing new toward an explanation of the discrepancies between the conclusions of various physiologists and neurologists as to the sensory conduction-paths in the spinal cord; but it may possess some value as illustrating anew a complex of symptoms altogether not very frequently met with, and only very rarely observed as the result of a cord-wound at so low a level. Gowers¹ remarks: "It is not until nearly the middle of the dorsal region is reached that a unilateral lesion causes crossed sensory and motor paralysis. In the lowest part of this region and in the upper part of the lumbar enlargement a lesion on one side impairs sensation on the same side as the motor." More recently the same author² states: "A lesion on one side of the lumbar enlargement often affects sensation on the same side as motion, because it damages the sensory path before it has crossed."

The restitution of motor function and the persistence of anesthesia are in accord with the usual experience after such injuries in man.³ Experiments indicate that the return of motor power is not due to a regeneration of the white fibers of the motor tract, but to the trans-

¹ "On the Antero-lateral Ascending Tract of the Spinal Cord," *Lancet*, 1886.

² *A Manual of Diseases of the Nervous System*. Second edition, 1892, vol. i, p. 229.

³ See Köbner: "Spinale Hemiplegie." *Deutsche Arch. f. klin. Med.*, xix, 1867, and Turner, loc. cit.

mission of efferent impulses by decussating paths from the opposite side. (Turner, Rossolymo, Mott.)

The dissociation of sensibility is not very rare, tactile sensibility, according to Gowers,¹ being unaffected in one-third of the cases.

Charcot² considers these lesions of the cord very dangerous (*graves au premier chef*), and states that the victims die at the latest fifteen days after the injury. A consideration of a number of cases has shown that the prognosis is not so unfavorable.

¹ See Manual, p. 230.

² *Leçons du Mardi*, 1888-89, p. 54.

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